ELECTRONIC SERVICE
1200 KONA DRIVE
COMPTON, CA 90220
(213) 605-1260

MN-445B

NOISE METER

MEGURO ELECTRONICS CORPORATION
1-5, 2-CHOME CHUO-CHO
MEGURO-KU TOKYO JAPAN

The Meguro Electronics Corporation would like to thank you for purchasing this instrument. In order for you to get the most out of your new instrument, please read carefully and follow the instructions for use and care given in this document.

PRECAUTIONS FOR USE

1. The operating temperature range of this instrument is 0°C ∿ 40°C (with relative humidity 20% ∿ 80%). Note, however, that the performance is guaranteed in the range 5°C ∿ 35°C.

2. To prolong life of components and improve their reliability, it is recommended that care be taken to operate the instrument from an AC line source that matches the setting on the AC line voltage selector.

3. Before turning the POWER switch to ON, verify that the meter is mechanically zeroed. If it has not been zeroed, adjust to zero using a screw driver.

4. Care should be taken not to apply voltages to the INPUT connector in excess of the maximum allowed input voltage (DC component plus peak value must not exceed 450V).

5. Whiping the meter cover briskly to remove dirt can cause it to be electrically charged, which can cause measurement display errors.

6. Allow a warmup period of approximately three minutes after turning the POWER switch to ON.

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SECTION 1

INTRODUCTION

1.1 GENERAL

The MN-445B is a high-sensitivity electronic voltmeter capable of measuring AC voltages in the frequency range 10Hz ∿ 500kHz. The display can be weighted to DIN and CCIR standards for peak value display in addition to conventional average and rms display capabilities.

In addition, five different DIN, JIS, CCIR standard weighting filters have been provided for use in measuring noise voltages and S/N ratio. A 10μV fullscale range is provided, enabling measurements on all types of recording, playback, and other audio equipment.

A built-in adjustment of gain used for S/N measurements, enables the convenient setting of relative levels.

1.2 FEATURES

1.2.1 Weighting Filters

The following five auditory compensation weighting filters are built into the MN-445B.

(a) DIN 45405 (1967) for measurement of external voltage (DIN/AUDIO)

(b) DIN 45405 (1967) for measurement of noise voltages (DIN/NOISE)

(c) JIS C1502A
JIS C5551A
IHF-A-202
IEC 179-A
NAB
for measurement of noise voltages (JIS A)

(d) CCIR (468-1)
CCIR (468-2)
DIN 45405 (1978)
for measurement of noise voltages (CCIR)

(e) CCIR/ARM
IHF-A-202
for measurement of noise voltages (CCIR/ARM)

1.2.2 Display Methods

(a) DIN 45405 (1967)
DIN 45405 (1978) sine wave rms scale using a quasi-peak
CCIR (468-1) detector (Q-PEAK)
CCIR (468-2)

(b) Sine wave rms scale using an averaging detector (AVER)

(c) Sine wave rms scale using an rms detector (RMS)

1.2.3 A built-in gain adjustment is available which can adjust the gain continuously over the range 0 through approximately -10dB.

1.2.4 AC OUTPUT and DC OUTPUT connectors have been provided enabling the instrument to be used as an amplifier with a gain of 100dB (at maximum sensitivity).

1.2.5 CCIR/ARM auditory compensating filters have been built into the MN-445B enabling noise measurements of audio equipment making use of Dolby noise reduction circuits.

1.3 ACCESSORIES

Item	Qty	Remarks
Input cable	1	Alligator clip to BNC plug
Fuses	2	0.5A or 0.3A Slow Blow
Instruction manual	1	

SECTION 2

SPECIFICATIONS

Measurement frequency range	10Hz∿500kHz (When not using a weighting filter)
Measurement voltage range	10μV∿300V (16 fullscale ranges) 0∿0.01mV, 0∿0.03mV, 0∿0.1mV, 0∿0.3mV, 0∿1mV, 0∿3mV, 0∿10mV, 0∿30mV, 0∿100mV, 0∿300mV, 0∿1V, 0∿3V, 0∿10V, 0∿30V, 0∿100V, 0∿300V -100dB∿+50dB (fullscale) 0dB = 1Vrms -98dBm∿+52dBm (fullscale) 0dBm = 0.775Vrms
Display accuracy	AVER ±3% of fullscale for each range Q-PEAK, RMS ±5% of fullscale for each range (Excluding measurements of above 100V or 42dBm 10μV,30μV renge and measurements using weighting filters)
Frequency response	AVER 10μV range 20Hz∿20kHz ±5% 10Hz∿30kHz ±7% 10Hz∿50kHz ±15% 30μV, 100μV ranges 20Hz∿100kHz ±5% 10Hz∿200kHz ±7% 10Hz∿300kHz ±15% 300μV ranges and above 20Hz∿200kHz ±3% 10Hz∿500kHz ±7% Q-PEAK, RMS 10μV range 20Hz∿20kHz ±10% 10Hz∿30kHz ±15% 30μV range and above 10Hz∿50kHz ±10%

Display method and scales

DIN 45405 (1967)
DIN 45405 (1978)
CCIR (468-1)
CCIR (468-2)

Sine wave rms scale using a quasi-peak detector (refer to Section 3.6, page , and Section 3.7, page 18) (Q-PEAK)

Sine wave rms scale using an averaging detector (AVER) (AVER)

Sine wave rms scale using an rms detector (Crest factor < 2) (RMS)

CAUTION

When measuring noise voltages using the CCIR/ARM weighting filters, regardless of the position of the INDICATION switches, the averaging detection method (AVER) is automatically selected.

Weighting filters

(Refer to Section 3.8, page 20)

DIN 45405 (1967) audio signal (10Hz∿ 20kHz) measurement signal (DIN/AUDIO)

DIN 45405 (1967) noise voltage measurement filter (DIN/NOISE)

JIS C1502A
JIS C5551A
IHF-A-202
IEC 179-A
NAB
Noise voltage measurement filters (JIS A)

CCIR (468-1)
CCIR (468-2)
DIN 45405 (1978)
Noise voltage measurement filters (reference at 1kHz 0dB) (CCIR)

CCIR/ARM (Dolby system) noise voltage measurement filters (reference at 2kHz 0dB) (CCIR/ARM)

Sensitivity adjustment range	0∿-10dB, min.
Input impedance	1MΩ, unbalanced Parallel capacitance approx. 30pF
Maximum allowable input voltage	10μV∿30mV ranges 10Vrms, 450VDC 100mV range and above 330Vrms, 450VDC + AC Peak
Output voltage	Meter fullscale open circuit voltage AC 1Vrms ±10% DC 1V ±10%
Output voltage frequency response	AC 10Hz∿500kHz ±5% (600Ω load) DC 10Hz∿500kHz ±5%
Output impedance	AC approx. 600Ω, unbalanced DC approx. 1kΩ, unbalanced
Residual noise	AVER, RMS 10μV range 1.5μV, max. 30μV range 3.0μV, max. Q-PEAK 10μV range 2.0μV, max. 30μV range 4.0μV, max.
Operating temperature range	0°C ∿ 40°C (specifications guaranteed in the range 0°C ∿ 35°C)
Stability with respect to supply voltage variations	All specifications guaranteed within ±10% of the specified AC line voltage.
Power supply	100/115/215/230VAC ±10% 50/60Hz, approx. 14VA
Maximum dimensions	150(W) x 210(H) x 310(D)mm
Weight	Approx. 5kg

SECTION 3

OPERATION

3.1 CONTROLS AND CONNECTORS

Front panel

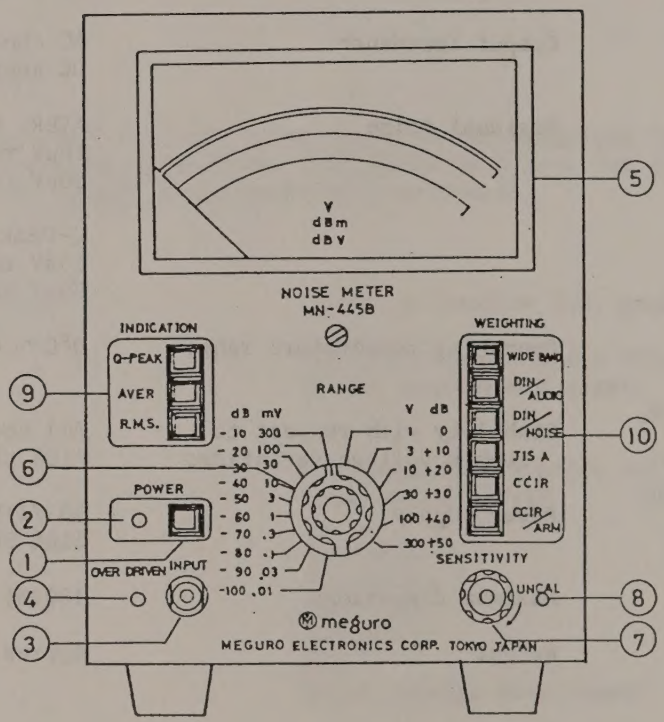

Fig. 3-1

Rear panel

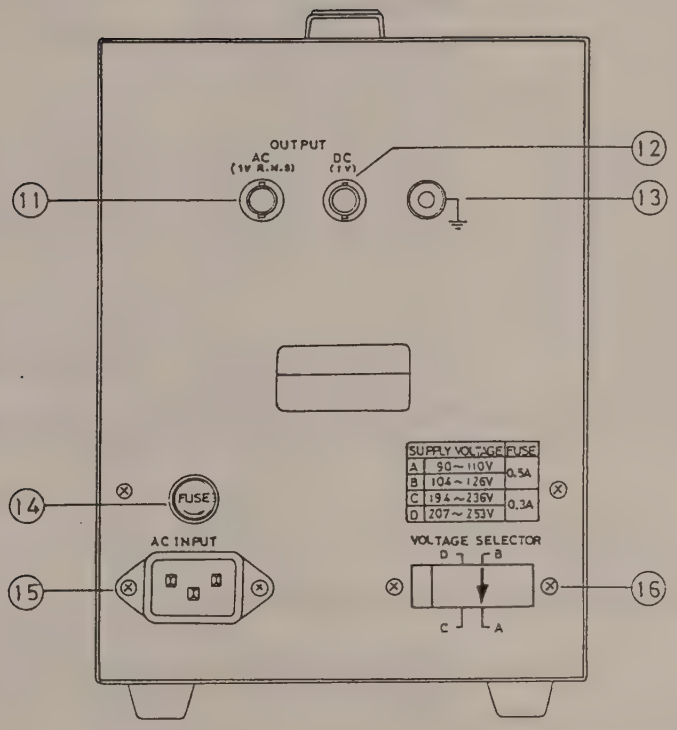

Fig. 3-2

3.2 FUNCTIONS OF CONTROLS AND CONNECTORS

Refer to the front panel as shown in Fig. 3-1 (page 6).

1 POWER pushbutton switch

The MN-445B on/off switch.

2 POWER LED

This LED lights when the power supply is turned ON.

3 INPUT BNC connector

This is the MN-445B input connector. The input impedance is 1MΩ, unbalanced.

4 OVERDRIVEN LED

When performing weighted measurements or when pulse noise is present in the measured signal, this monitor lamp lights as an indication that an overdriven condition exists to prevent measurement errors.

5 METER

This meter displays the level of the measured signal and is used in conjunction with the RANGE switch, SENSITIVITY control, and WEIGHTING switch.

Four types of scales are provided.

0 ∿ 3V
0 ∿ 1V
-20 ∿ +2dBm
-20 ∿ 0dBV

6 RANGE rotary switch

This rotary switch allows selection of the following 16 ranges which are calibrated for sensitivity when the SENSITIVITY control is in the CAL position.

-100dB	0.01mV ,	-90dB	0.03mV
-80dB	0.1mV ,	-70dB	0.3mV
-60dB	1mV ,	-50dB	3mV
-40dB	10mV ,	-30dB	30mV
-20dB	100mV ,	-10dB	300mV
0dB	1V ,	+10dB	3V
+20dB	10V ,	+30dB	30V
+40dB	100V ,	+50dB	300V

7 SENSITIVITY control

This control allows continuous variable adjustment of the sensitivity for the METER. In the CAL position the absolute value of the signal being measured can be read, and by setting it off the CAL position the meter sensitivity can be varied approximately 10dB.

8 UNCAL LED

This LED indicates that the SENSITIVITY control is in the UNCAL position.

9 INDICATION pushbutton switches

This switch allows selection of the level meter indication method as follows.

Q-PEAK

DIN 45405 (1967, 1978), CCIR (468-1, 468-2) quasi-peak indication.

AVER

Used for conventional average value indication.

RMS

RMS indication for waveforms of crest factor up to 2

10 WEIGHTING pushbutton switches

These switches are used to select the measurement function of the MN-445B as follows.

WIDE BAND

This switch is used to select flat response for use of the MN-445B as a conventional level meter.

DIN/AUDIO

DIN 45405 (1967) audio (10Hz ∿ 20kHz) level measurement function.
For this function the INDICATION switch group should have the Q-PEAK switch depressed.

DIN/NOISE

DIN 45405 (1967) noise level measurement function. For this function the INDICATION switch group must have the Q-PEAK switch depressed.

JIS A

JIS C1502A, JIS C5551A, IHF-A-202, IEF 179-A, and NAB noise level measurement function.

CCIR

CCIR (468-1, 468-2), and DIN 45405 (1978) noise level measurement function.

CCIR/ARM

This function is used for noise level measurements on Dolby system equipment (reference at 2kHz, 0dB).
When the FUNCTION is in this position, the INDICATION mode automatically switches to AVER.

Refer to the rear panel as shown in Fig. 3-2 (page 7).

11 AC OUT BNC connector

This is a monitor output connector at which a 1Vrms AC maximum signal is available (meter fullscale). The output impedance is approximately 600Ω, with the ideal load impedance being 47kΩ.

12 DC OUT BNC connector

This is a monitor output connector at which a 1V DC maximum signal is available (meter fullscale). The output impedance is approximately 1kΩ, with the ideal load impedance being 47kΩ.

13 Ground terminal

This terminal is provided for making connections to an external ground.

14 FUSE holder

This fuse holder is provided with a 0.5A fuse for 90 ∿ 126VAC operation or a 0.3A fuse for 194 ∿ 253VAC operation.

15 AC INPUT cable

This power cable is used to connect to the required AC power source. It is terminated with an appropriate connector.

16 VOLTAGE SELECTOR

This voltage selector makes use of the power supply transformer primary winding to select the input line voltage by setting the selector plug (↓) to the desired voltage (A ∿ D) as printed on the rear panel.

3.3 PREPARATIONS FOR MEASUREMENTS

3.3.1 Set the POWER switch to OFF, and connect the AC power cable to an AC power source of the proper voltage.

3.3.2 Connect the accessory input cable to the INPUT connector.

3.3.3 Set the RANGE switch to 300V ±50dB, and the SENSITIVITY control to CAL.

3.3.4 When the above settings have been completed, set the POWER switch to ON. When this is done the pilot lamp should light and the MN-445B should be ready to operate. Connect the input cable to the point to be measured.

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3.4 NOISE MEASUREMENTS

After completing the preparations for measurements outlined in Section 3.3, measurements are performed in the following described manner.

3.4.1 Set the INDICATION switch group and WEIGHTING switch group by referring to the summary Table 3-1.

WEIGHTING Switch group Items in parantheses are standards / INDICATION Switch group		Q-PEAK	AVER	RMS
DIN/NOISE (DIN 45405 1967)		○		
JIS C1502A JIS C5551A			(see note) ○	
JIS A	(1EC-179-A)			○
	(NAB)			○
	(DIN 45633)			○
	(IHF-A-202)		○	
CCIR (468-1, 468-2) DIN (DIN 45405 1978)		○		
CCIR/ARM			○	

Table 3-1

The load settings should be made to suit the measurement standards required as follows.

(a) DIN/NOISE (DIN 45405-1967) noise measurements
WEIGHTING switch DIN NOISE
INDICATION switch Q-PEAK

(b) JIS A (JIS C1502A, C5551A) noise measurements
FUNCTION switch JIS A
WEIGHTING switch RMS or AVER

NOTE

While the JIS A standard display method yields an rms display, in general the sine wave rms display method which uses averaging detection is employed.
For this reason, when using sine wave rms value display to indicate the true rms detected value of noise, differences will occur in measured values as compared to previously used techniques.

(c) IEC-A (IEC-179-A)
NAB
DIN (DIN 45633)
for measurements of noise
WEIGHTING switch JIS A
INDICATION switch RMS

(d) IHF-A (IHF-A-202) noise measurements
WEIGHTING switch JIS A
INDICATION switch AVER

(e) CCIR (CCIR 468-1, 468-2), and DIN (DIN 45405 1978) noise measurements
WEIGHTING switch CCIR
INDICATION switch Q-PEAK

(f) CCIR/ARM noise measurements
WEIGHTING switch CCIR/ARM

NOTE

When the WEIGHTING swtich group is set to CCIR/ARM, the AVER indication mode is selected automatically regardless of the setting of the INDICATION switch group.

3.4.2 Sequence the RANGE switch through progressively more sensitive positions (300V + 50dB, 100V + 40dB, 30V + 30dB, etc.) to obtain an easily readable meter display of noise level measured value.

3.5 S/N MEASUREMENTS

After completing the preparations for measurement detailed in Section 3.3 (page 10), actual measurements are performed as described below.

3.5.1 Set the INDICATION and WEIGHTING switches as appropriate to the measurement being performed. Refer to Table 3-2.

NOTES

1. While the JIS A (C1502A and C5551A) standard display method yields an rms display, in general the sine wave rms display method which uses averaging detection is employed at present. For this reason, when using sine wave rms value display to indicate the true rms detected value, differences will occur in measured values as compared to previously used techniques.

2. When performing CCIR (468-1 and 468-2) measurements, be sure that the measured single frequency is 1kHz.

WEIGHTING switches and measurement standards \ INDICATION switches		Q-PEAK	AVER	RMS
(DIN 45405 1967)		○		
DIN/ AUDIO	JIS C1502A JIS C5551A		(Note 1) ○	○
	(IEC-179-A)			○
	(NAB)			○
	(DIN 45633)			○
	(IHF-A-202)		○	
	CCIR/ARM		○	
CCIR (468-1, 468-2) DIN (DIN 45405 1978) Measured signal frequency is 1kHz (Note 2)		○		

Table 3-2

(a) DIN (DIN 45405 1967) measurements
WEIGHTING switch — DIN AUDIO
INDICATION switch — Q-PEAK

(b) JIS A (JIS C1502A, C5551A) measurements
WEIGHTING switch — DIN AUDIO
INDICATION switch — RMS or AVER

(c) IEC-A (IEC-179-A)
NAB measurements
DIN (DIN 45633)
WEIGHTING switch — DIN AUDIO
INDICATION switch — RMS

(d) IHF-A (IHF-A-202) measurements
WEIGHTING switch — DIN AUDIO
INDICATION switch — AVER

(e) CCIR (CCIR 468-1, 468-2) measurements
WEIGHTING switch — CCIR
INDICATION switch — Q-PEAK

(f) CCIR/ARM measurements
WEIGHTING switch — DIN AUDIO
INDICATION switch — AVER

3.5.2 Sequence the range switch through progressively more sensitive positions (300V + 50dB, 100V + 40dB, 30V + 30dB, etc.) to obtain an easily readable meter display.

The procedure thus far will allow the reading of the absolute value of the level of the signal under measurement S. To perform S/N measurements, however, relative measurements are performed as outlined in Sections 3.5.3 and 3.5.4.

3.5.3 Using the RANGE switch, raise the sensitivity of the Meter one range so that the meter is pinned.

Example: If the level of the signal being measured in Section 3.5.2 was 1.5Vrms, the RANGE switch was finally set to 3V + 10dB so that it should now be set to the 1V, 0dB range, causing the pinning of the meter needle.

3.5.4 Turn the SENSITIVITY control CCW such that the meter needle is alligned with the 0dB scale mark.

The above procedure sets the signal S level as the 0dB reference. We will now measure the level of noise N.

3.5.5 Set the WEIGHTING switches in a manner appropriate to the measurement to be made, referring to Table 3-1 (page 12).

NOTE

The INDICATION switch group can be left in the same state as was used for the measurement of the main signal S.

(a) DIN NOISE (DIN 45405 1967) measurements
WEIGHTING switch DIN NOISE

(b) JIS A (JIS C1502A, C5551A) measurements
WEIGHTING switch JIS A

(c) IEC-A (IEC-179-A)
NAB measurements
DIN (DIN 45633)
WEIGHTING switch JIS A

(d) IHF-A (IHF-A-202) measurements
WEIGHTING switch JIS A

(e) CCIR (CCIR 468-1, 468-2) measurements
WEIGHTING switch CCIR

(f) DIN (DIN 45405 1978) measurements
WEIGHTING switch CCIR

(g) CCIR/ARM measurements
WEIGHTING switch CCIR/ARM

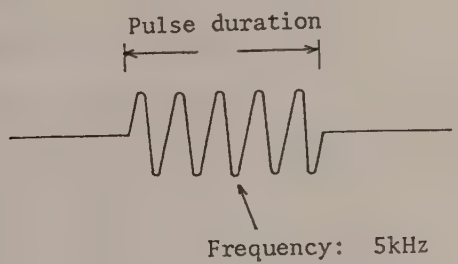
3.5.6 After the settings described in Section 3.5.5 have been made, the Meter will read the level of the noise component N. The RANGE switch should be adjusted to increase the Meter sensitivity to achieve an easily readable display.

After this measurement has been performed the noise level N in dB can be subtracted from the signal level S in dB to obtain the S/N ratio.

3.6 DIN STANDARDS

To be able to perform DIN standard quasi-peak measurements of noise and other voltages in accordance with the DIN 45405 1975 abstracted standard, measurement instrumentation must satisfy the following tests.

3.6.1 The test is performed using an AC signal from a single generator which is maintained for a specified length of time. The measurement instrument display must fall within the limits shown in Table 3-3. The frequency of the AC generator used in this test is 5kHz.

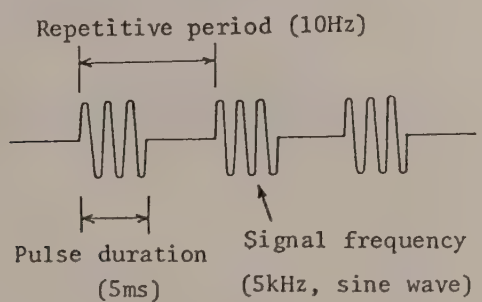


Pulse duration (ms)		10	20	50	100	200	∞
Nominal meter indication (%)		48	52	59	68	80	100
Allowable display (%)	Upper	55	60	68	78	92	-
	Lower	41	44	50	58	68	-

Table 3-3

3.6.2 Tests are performed with the following signals and the Meter indication must read in the range 70 ∿ 90% of fullscale.

Pulse duration	5ms
Pulse repetition frequency	10Hz
Pulse internal frequency	5kHz



3.7 CCIR MEASUREMENTS

This section describes CCIR standard quasi-peak display as specified in the standard CCIR 468-2 as abstracted.

NOTE

This standard applies to DIN 45405 (1978) as well.

3.7.1 Single Pulse Test

The test is performed using an AC signal from a single generator which is maintained for a specified length of time. The measurement instrument display must fall within the limits shown in Table 3-4.

These measurement conditions apply to all measurement ranges in the region between 1/3 scale and fullscale. The frequency of the AC generator used in this test is 5kHz.

Pulse duration (ms)			1	2	5	10	20	50	100	200
Nominal meter indication		%	17.0	26.6	40	48	52	59	68	80
		dB	-15.4	-11.4	-8.0	-6.4	-5.7	-4.6	-3.3	-1.9
Allowable display	Upper	%	21.4	31.6	46	55	60	68	78	92
		dB	-13.4	-10.0	-6.6	-5.2	-4.4	-3.3	-2.2	-0.7
	Lower	%	13.5	22.4	34	41	44	50	58	68
		dB	-17.4	-13.0	-9.3	-7.7	-7.1	-6.0	-4.7	-3.3

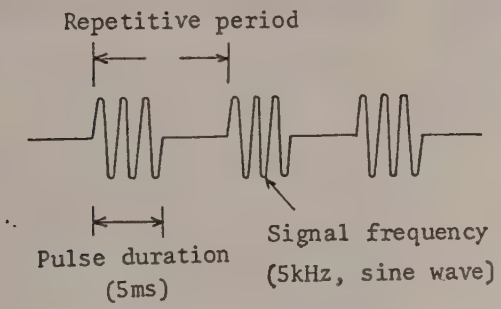
Table 3-4

3.7.2 Repetitive Pulse Test

A tone burst generator is used in this test to generate a tone burst of a specified length of time. The display values must fall within the limits shown in Table 3-5 (page 19).

These measurement conditions apply to all measurement ranges in the region between 1/3 scale and fullscale.

Pulse duration	5ms
Pulse internal frequency	5kHz (sine wave)

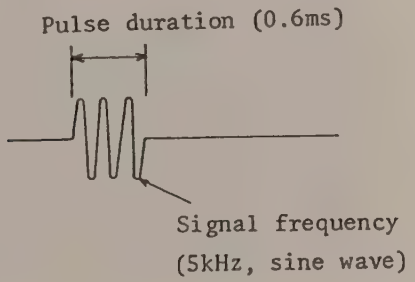


Pulse repetition freq. (Hz)			2	10	100
Nominal display		%	48	77	97
		dB	-6.4	-2.3	-0.25
Allowable display	Upper	%	53	82	100
		dB	-5.5	-1.7	0
	Lower	%	43	72	94
		dB	-7.3	-2.9	-0.5

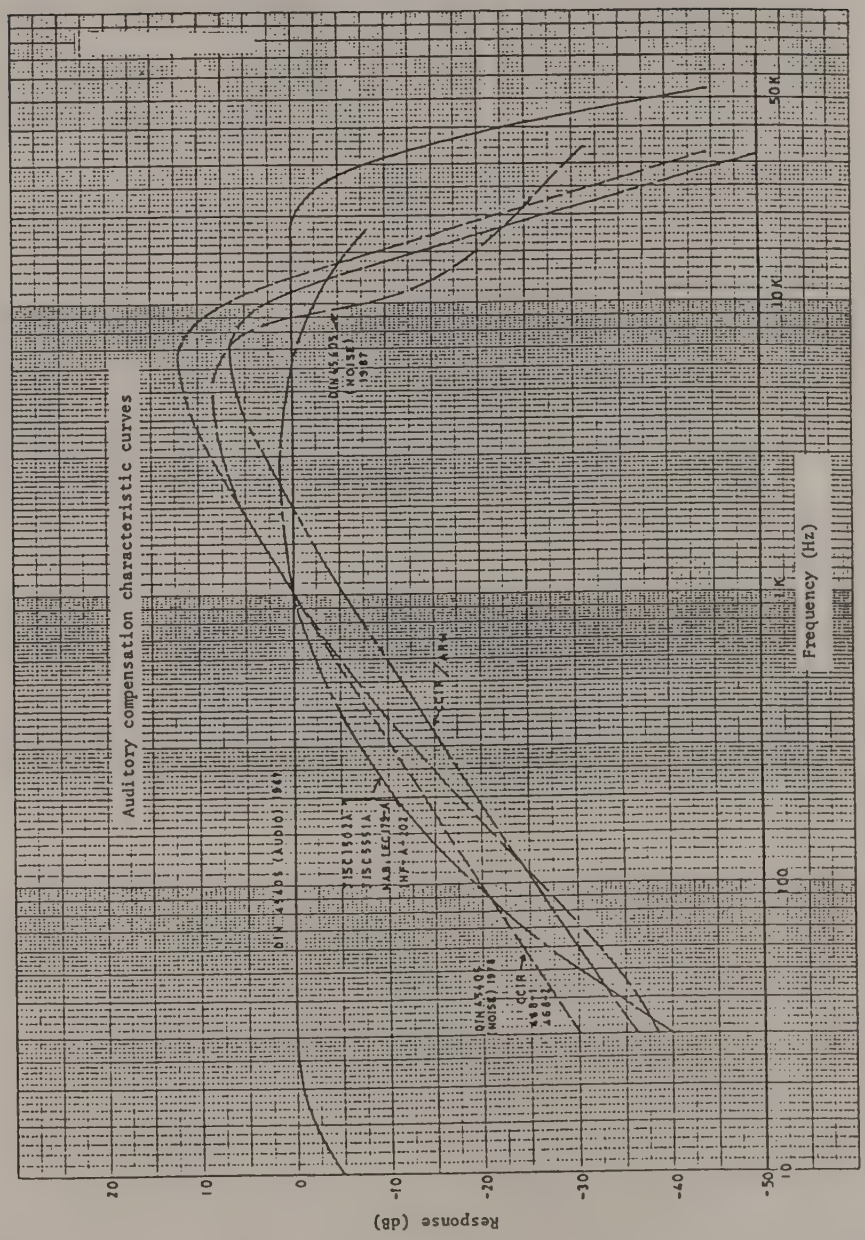
Table 3-5

3.7.3 Maximum Input Test

This test is performed by inputting a 5kHz sine wave pulse of duration 0.6ms and verifying that the displayed value over the range 0 ∿ -20dB tracks over all attenuation steps within ±1dB.



3.8 COMPARISON OF WEIGHTING STANDARDS



3.8.1 DIN 45405 (1967) Audio Measurement Filter Characteristics

Frequency	Response (dB)	Allowable error (dB)
4 Hz	≧- 20	
10	≧- 5	
31.5 kHz		
1	0	±0.5
20		
25	≧- 8	
50	≧- 40	

Fig. 3-5 DIN 45405 Audio weighting

3.8.2 DIN 45405 (1967) Noise Measurement Filter Characteristics

Frequency	Response (dB)	Allowable error (dB)
31.5 Hz	- 38	±1.5
63	- 31.6	±1.5
100	- 26.1	±1.5
200	- 17.3	±1.5
400	- 8.8	±1.5
800	- 1.9	±1.5
1 kHz	0	±0.5
2	+ 5.3	±1.5
4	+ 8.2	±1.5
5	+ 8.4	±0.5
6.3	+ 8.0	±1.5
8	+ 5.1	±2.0
10	- 9.7	+3, -2

Fig. 3-6 DIN 45405 Noise weighting

3.8.3 JIS C1502A, JIS C5551A, NAB, IHF-A-202, and IEC-179-A Noise Measurement Filter Characteristics

Frequency	Response (dB)	Allowable error (dB)
31.5 Hz	- 39.2	± 2
63	- 26.1	± 2
125	- 16.1	± 1
250	- 8.6	± 1
500	- 3.2	± 1
1 kHz	0	0
2	+ 1.2	± 1
3.15	+ 1.2	± 1
5	+ 0.5	± 1
6.3	- 0.1	± 1
10	- 2.4	± 1
12.5	- 4.2	± 2
16	- 6.5	± 2

Fig. 3-7 JIS C1502A, JIS C5551A, NAB, IHF-A-202, and IEC-179-A Noise weighting

3.8.4 CCIR (468-1, 468-2), and DIN 45405 (1978) Noise Filter Characteristics (1kHz, 0dB reference)

Frequency	Response (dB)	Allowable error (dB)
31.5 Hz	- 29.9	± 2
63	- 23.9	± 1.4
100	- 19.8	± 1
200	- 13.8	± 0.85
400	- 7.8	± 0.7
800	- 1.9	± 0.55
1 kHz	0	± 0.5
2	+ 5.6	± 0.5
3.15	+ 9	± 0.5
4	+ 10.5	± 0.5
5	+ 11.7	± 0.5
6.3	+ 12.2	0
7.1	+ 12	± 0.2
8	+ 11.4	± 0.4
9	+ 10.1	± 0.6
10	+ 8.1	± 0.8
12.5	0	± 1.2
14	- 5.3	± 1.4
16	- 11.7	± 1.65
20	- 22.2	± 2.0
31.5	- 42.7	+2.8, -∞

Fig. 3-8 CCIR (468-1, 468-2), and DIN 45405 (1978) Noise Weighting

3.8.5 CCIR/ARM Noise Filter Characteristics (2kHz, 0dB reference)

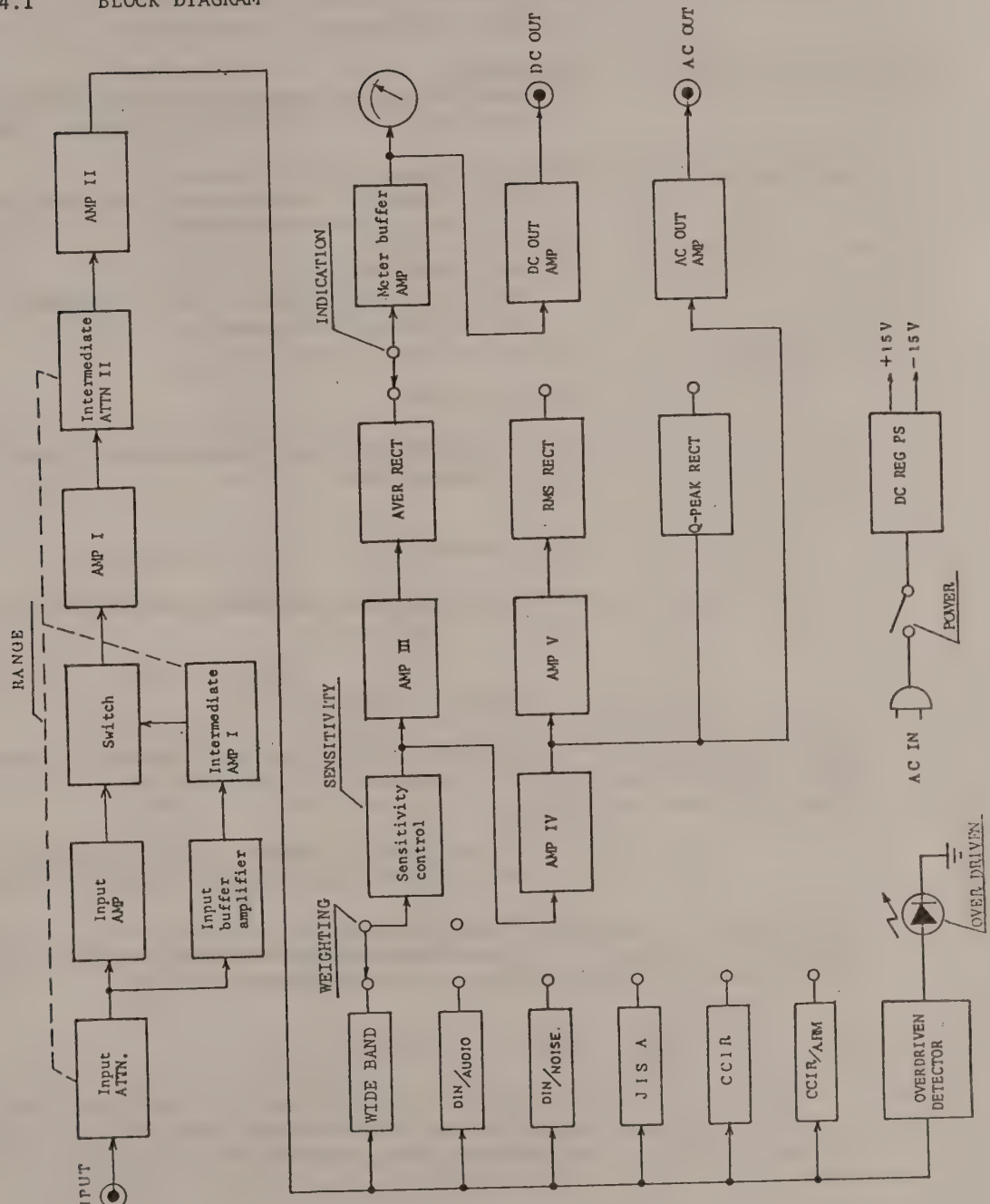
Frequency	Response (dB)	Allowable error (dB)
31.5 Hz	- 35.5	± 2
63	- 29.5	± 1.4
100	- 25.4	± 1
200	- 19.4	± 0.85
400	- 13.4	± 0.7
800	- 7.5	± 0.55
1 kHz	- 5.6	± 0.5
2	0	± 0.5
3.15	+ 3.4	± 0.5
4	+ 4.9	± 0.5
5	+ 6.1	± 0.5
6.3	+ 6.6	0
7.1	+ 6.4	± 0.2
8	+ 5.8	± 0.4
9	+ 4.5	± 0.6
10	+ 2.5	± 0.8
12.5	- 5.6	± 1.2
14	- 10.9	± 1.4
16	- 17.3	± 1.65
20	- 27.8	± 2
31.5	- 48.3	+2.8, -∞

Fig. 3-9 CCIR/ARM Noise weighting

SECTION 4

CIRCUIT DESCRIPTIONS

4.1 BLOCK DIAGRAM



4.2 CIRCUIT OPERATION

4.2.1 Input Attenuator

This 0/40/80dB resistive attenuator is switched by the RANGE selector switch.

(a) 0dB
This attenuator operates when the RANGE switch is in the -100, -90, -80, -70, -60, -50, -40, or -30dB range.

(b) 40dB attenuator
This attenuator operates when the RANGE switch is in the -20, -10, 0, or +10dB range.

(c) 80dB attenuator
This attenuator operates when the RANGE switch is in the 20, 30, 40, or 50dB range.

4.2.2 Input Amplifier

This is a high input impedance low-noise amplifier making use of an FET transistor.

4.2.3 Input Buffer Amplifier

This is a high input impedance amplifier of gain 0dB making use of an FET transistor.

4.2.4 Intermediate Attenuator I

This consists of a 0dB and 10dB resistive attenuator operated by the RANGE switch.

(a) 0dB
This attenuator operates when the RANGE switch is in the -60, -50, -40, -20, -10, 0, +20, +30, or +40dB range.

(b) 10dB attenuator
This attenuator operates when the RANGE switch is in the -30, +10, or +50dB range.

4.2.5 Amplifier Switching Circuit

This switching circuit selects the input signal for the amplifier I as either the output of the input amplifier or the intermediate amplifier I, in accordance with the level of the input signal being measured.

4.2.6 Amplifier I

This circuit is a low-noise amplifier of gain 15dB employing an FET transistor.

4.2.7 Intermediate Attenuator II

This resistive attenuator operates when the RANGE switch is in the 0, 10, 20 or 30dB position.

(a) 0dB
Operates when the RANGE switch is in the -100dB position.

(b) 10dB attenuator
Operates when the RANGE switch is in the -90, -60, -20 or +10dB position.

(c) 20dB attenuator
Operates when the RANGE switch is in the -80, -50, -10, or +30dB position.

(d) 30dB attenuator
Operates when the RANGE switch is in the -70, -40, -30, 0, +10, +40, or +50dB position.

4.2.8 Amplifier II

This three-transistor amplifier has a gain of 20dB.

4.2.9 Weighting Filters

These filters are selected by means of the WEIGHTING switch group and provide compensation for auditory sensitivity in accordance with DIN AUDIO, DIN NOISE, JIS A, CCIR, and CCIR/ARM standards as well as an additional position which provides WIDE BAND response.

4.2.10 OVERDRIVEN Detector Circuit

This circuit consists of a transistor/diode rectifying circuit and operational amplifier converter. It serves to sense the overdriven condition and drive the OVERDRIVEN LED warning display.

4.2.11 SENSITIVITY CONTROL

Using the SENSITIVITY CONTROL the input signal level can be continuously varied up to 10dB providing control of meter sensitibity.

4.2.12 Amplifier III

This single-stage operational amplifier has a gain of approximately 40dB.

4.2.13 Amplifiers VI and V

These single-stage operational amplifiers have gains of approximately 23dB and 16dB respectively.

4.2.14 Rectifier Circuit

This circuit consists of an absolute value rectification circuit and the associated resistors and capacitors. By using the INDICATION switch group, quasi-peak detection (Q-PEAK), average detection (AVER), or effective value (RMS) display may be selected.

4.2.15 AC OUT Amplifier

This single-stage operational amplifier has a gain of approximately 10dB.

4.2.16 DC Amplifier

This single-stage operational amplifier is a DC amplifier having a gain of approximately 12dB.

4.2.17 Power Supply

This is an IC regulated power supply circuit providing ±15V regulated voltage.

SECTION 5

MAINTENANCE

5.1 PERIODIC INSPECTION AND RECALIBRATION

Stable and accurate operation is required to ensure proper measurements using the MN-445B.

To ensure such operation, a periodic inspection should be made of this unit at least every six months and, when required, the MN-445B should be recalibrated.

5.2 VISUAL INSPECTION

As a preventative maintenance measure, the following items should be checked for at the time of recalibration.

Loose or damaged switches and terminals

Loose or damaged connectors

Loosened screws

Metalic debris

Signs of burnt resistors

5.3 USAGE AND STORAGE ENVIRONMENT

5.3.1 Using or storing the MN-445B in any of the following types of locations can cause mechanical, chemical, or other related failures, and as such should be avoided.

Locations subject to direct sunlight

Locations having high humidity

Locations subject to high dust levels

Locations subject to high vibration levels

Locations subject to strong electromagnetic fields

5.3.2 The MN-445B is designed for stable operation in the temperature range 0°C ∿ 40°C. Using the instrument at temperatures below 0°C or on top of heat generating equipment should be avoided.

5.4 FUSE REPLACEMENT

Whenever a fuse has blown, remove the cap of the fuse holder on the rear panel by turning it in the direction of the arrow to allow fuse replacement.

The capacity of the fuse to be used depends upon the input line voltage as summarized in Table 5-1.

In addition, should repeated fuse blowings be encountered, an equipment failure should be suspected. The failure cause should be clearly determined before further fuse replacements are performed.

AC Line voltage	Voltage selector position	Fuse
90 ∿ 110V	A	0.5A
104 ∿ 126V	B	
194 ∿ 236V	C	0.3A
207 ∿ 253V	D	

Table 5-1

5.5 REMOVING THE CASE

NOTE

Care should be taken to remove the AC line cord before removing the MN-445B from its case.

5.5.1 Case Removal (See Fig. 5-1, page 31)

Remove the two screws on either side of the MN-445B and the two screws on top of the instrument. While pressing down on the front panel at its top, use the handle to remove the case.

5.5.2 Rear Cover Removal (See Fig. 5-1, page 31)

The rear cover of the MN-445B is retained by the four screws shown in Fig. 5-1. Removing these screws allows the rear cover to be removed.

CASE REMOVAL

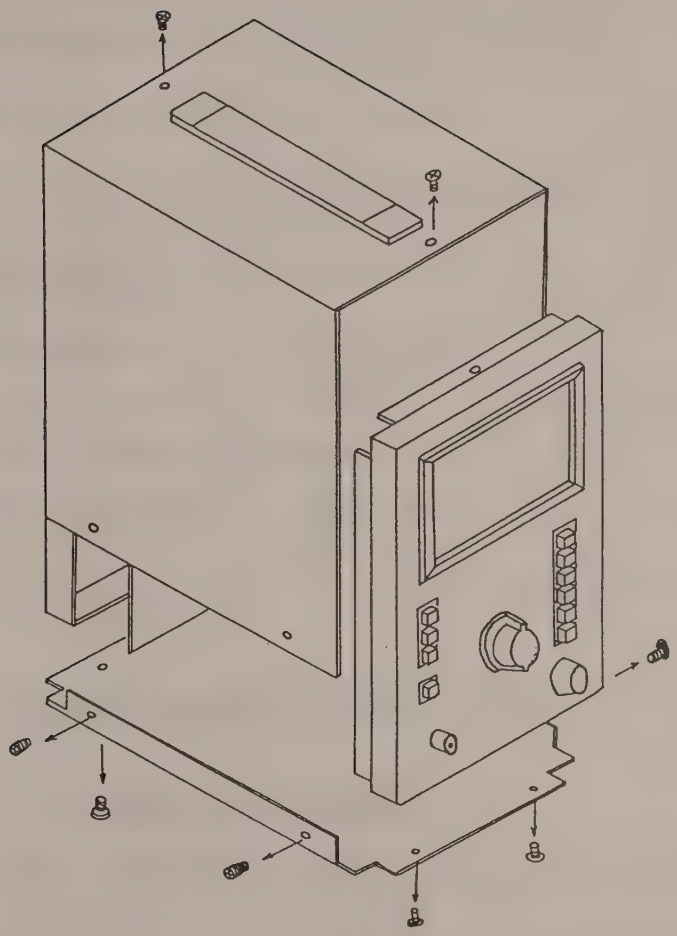


Fig. 5-1

5.6 EQUIPMENT REQUIRED FOR INSPECTIONS AND CALIBRATIONS

Inspections and calibrations of the MN-445B require the equipment listed in Table 5-2.

Item	Description		Recommended Type
LF oscillator	Frequency range Output Distortion	5Hz∿1MHz 600Ω, open circuit 0.2%, max.	Meguro MCR-4031
Electronic voltmeter	Frequency range	measurement to -100dB (0dB=1V) in the range 10Hz∿1MHz	
Frequency counter	Frequency range	10Hz∿1MHz	
Oscilloscope	DC∿10MHz band width with 10mV/cm sensitivity		MO-1252A MO-1254A
Resistive attenuator (600Ω)	Frequency range	0∿-100dB in 0.1dB steps in the range 10Hz∿500kHz	
DC voltmeter	0∿30V		MD-30
Voltage calibrator	Calibrated output in the range 0.01mV∿300V at 1kHz		

Table 5-2

5.7 NOTES ON PERFORMING INSPECTIONS AND CALIBRATIONS

5.7.1 Before turning the POWER switch ON, verify that the meter has been mechanically zeroed.

5.7.2 Verify that the AC line power voltage is within the specified range.

5.7.3 Perform inspections and calibrations within the temperature range 10°C ∿ 30°C in a location free from significant noise.

5.7.4 After turning the POWER switch ON, allow approximately ten minutes warmup period.

This warmup period should apply to the measurement instruments used in the inspection and calibration procedure.

5.7.5 Perform these procedures only after reading and fully understanding this document.

5.7.6 If the instrument does not meet its specifications even after calibration, an instrument failure might have occurred. In this case please contact the appropriate service department.

5.8 PREPARATIONS FOR INSPECTIONS AND CALIBRATIONS

5.8.1 Before connecting the power cable to the AC line power source, set the panel switches as follows.

POWER switch	OFF
RANGE switch	300V, + 50dB
SENSITIVITY control	CAL
INDICATION switch	Q-PEAK
WEIGHTING switch	WIDE BAND

5.8.2 Connect the power cable to an AC line power source of the specified voltage.

5.8.3 Turn the POWER switch to ON, and allow a warmup period of approximately ten minutes.

5.9 VERIFICATION OF POWER SUPPLY VOLTAGES

Using a digital voltmeter, measure the voltages between TP1 and TP2 and ground as being ±15V (within the range 14.4 ∿ 15.6V).

The power supply circuit uses an IC regulator to determine the output voltage. Should the output voltage be greatly different than the specified range, an IC failure may be suspected.

5.10 ADJUSTMENT OF METER SENSITIVITY, AC OUTPUT LEVEL AND DC OUTPUT LEVEL

5.10.1 Connect the MN-445B to a low frequency oscillator, frequency counter, resistive attenuator, and wideband electronic voltmeter as shown in Fig. 5-2.

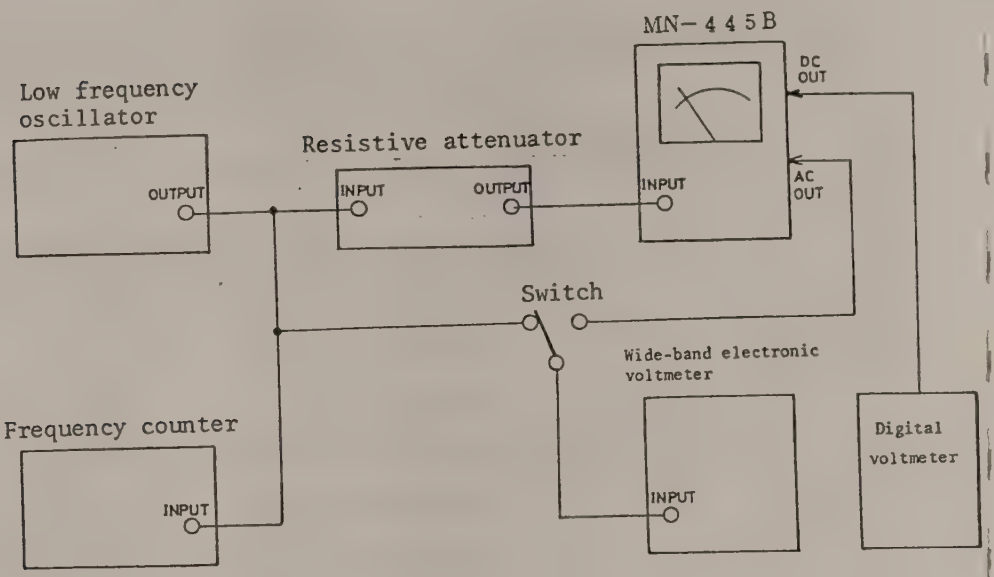


Fig. 5-2

5.10.2 Set the low frequency oscillator output frequency to 1kHz and the output level to 1Vrms.

5.10.3 Set the resistive attenuator to 0dB.

5.10.4 Set the front panel switches and controls as follows.

RANGE switch	1V, 0dB
SENSITIVITY control	CAL
INDICATION switch	Q-PEAK
WEIGHTING switch	WIDE BAND

5.10.5 Verify that the Meter displays 1Vrms and if not use R183 (Q-PEAK ADJ) to bring it to this value.

5.10.6 Set the INDICATION switch group to AVER. In this condition verify that the Meter reads 1Vrms. If it does not read this value use R187 (AVER ADJ) to bring it to this value.

5.10.7 Set the INDICATION switch group to RMS. Verify that the Meter reads 1Vrms. If it does not read this value use R185 (RMS RDJ) to bring it to this value.

5.10.8 Next, set the resistive attenuator to -70dB and the front panel controls as follows.

RANGE switch	0.3mV, -70dB
INDICATION switch	PEAK

In this condition verify that the Meter reads -70dBV. If it does not use R31 (GAIN ADJ) to adjust it to this value.

5.10.9 Once again, set the front panel controls as described in Section 5.10.4 and verify the AC output level (1Vrms for meter fullscale) and DC output level (1V for meter fullscale). If these values are not observed, use R147 (AC OUT ADJ) and R190 (DC OUT ADJ) to correct these outputs.

5.11 WEIGHTING FILTER ADJUSTMENTS

5.11.1 Connect the MN-445B to a low frequency oscillator, frequency counter, resistive attenuator, and wide-band electronic voltmeter as shown in Fig. 5-2 (page 34).

5.11.2 Set the output frequency at the low frequency oscillator to 1kHz and the output level to 1Vrms.

5.11.3 Set the resistive attenuator to 0dB.

5.11.4 Set the front panel controls and switches as follows.

RANGE switch	1V, 0dB
SENSITIVITY control	CAL

INDICATION switch AVER

WEIGHTING switch WIDE BAND

5.11.5 Verify that the meter reads 1Vrms.

5.11.6 Set the WEIGHTING switch group to DIN/AUDIO. In this condition verify that the meter reads 1Vrms. If it does not use R12 (AUDIO ADJ) on PCB-2 to adjust this display.

5.11.7 Set the WEIGHTING switch group to DIN/NOISE. In this condition verify that the meter displays 1Vrms. If it does not use R25 (NOISE ADJ) on PCB-2 to adjust this display.

5.11.8 Set the WEIGHTING switch group to JIS A. In this condition verify that the meter display is 1Vrms. If it is not use R35 (JIS ADJ) on PCB-2 to adjust this display.

5.11.9 Set the WEIGHTING switch group to CCIR. In this condition verify that the meter display is 1Vrms. If it is not use R45 (CCIR ADJ) on PCB-2 to adjust this display.

5.11.10 Set the WEIGHTING switch group to CCIR/ARM and the output frequency of the low frequency oscillator to 2kHz. In this condition verify that the meter display is 1Vrms. If it is not use R48 (ARM ADJ) on PCB-2 to adjust this display.

5.12 TRIMMER LOCATIONS

5.12.1 PCB-1

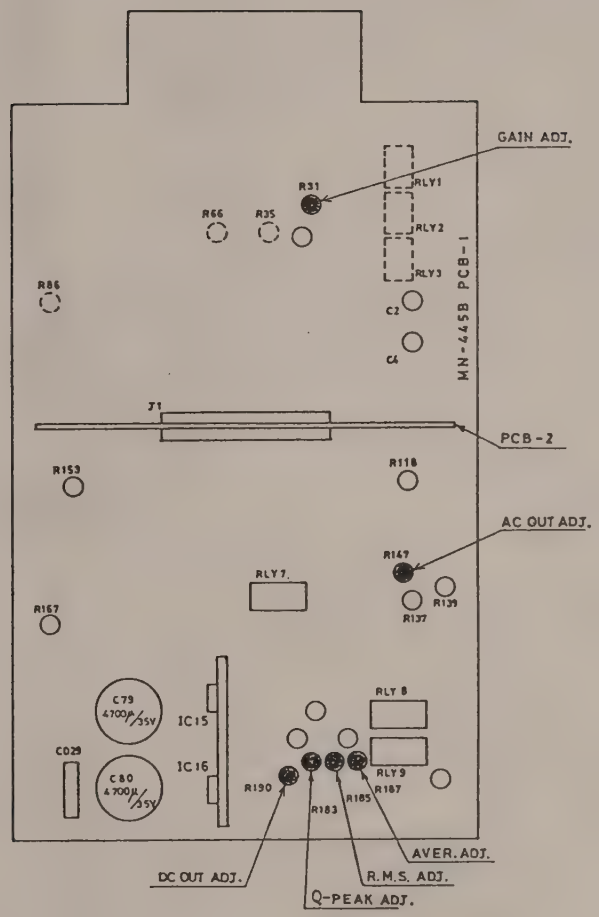


Fig. 5-3

5.12.2 PCB-2 (Weighting Filters)

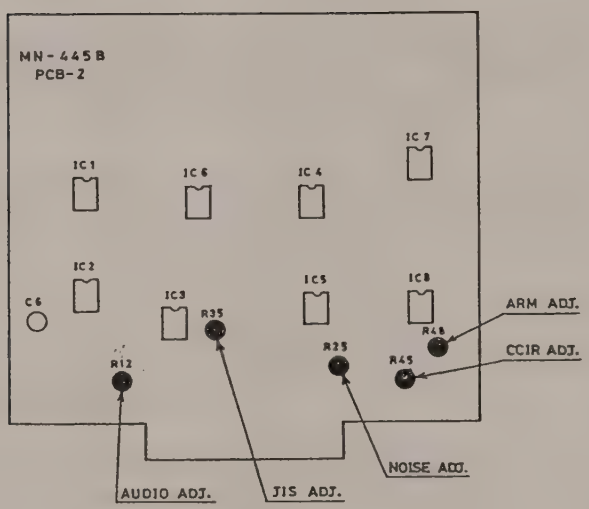
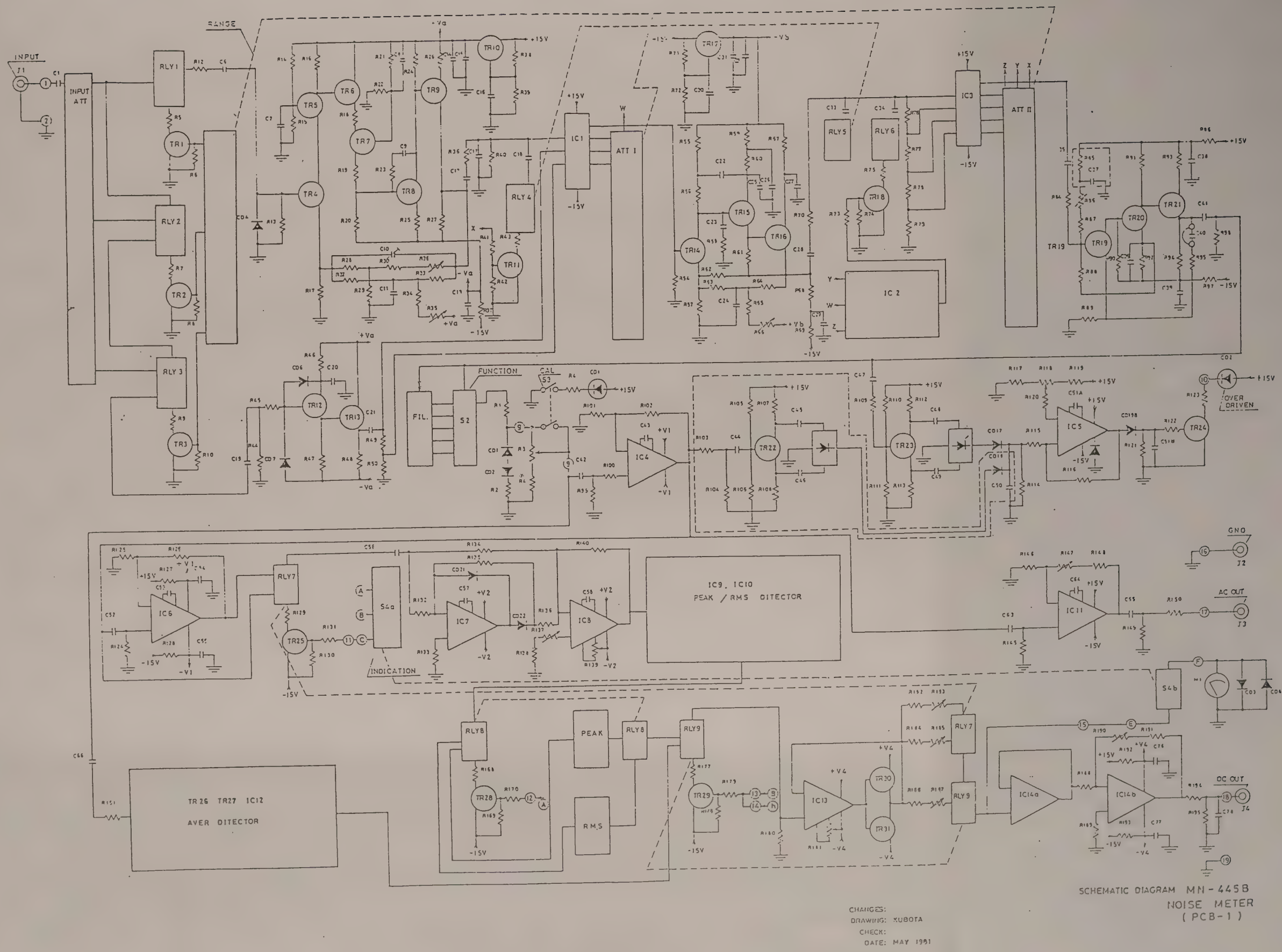


Fig. 5-4



SCHEMATIC DIAGRAM MN-445B
NOISE METER
(PCB-1)

CHANGES:
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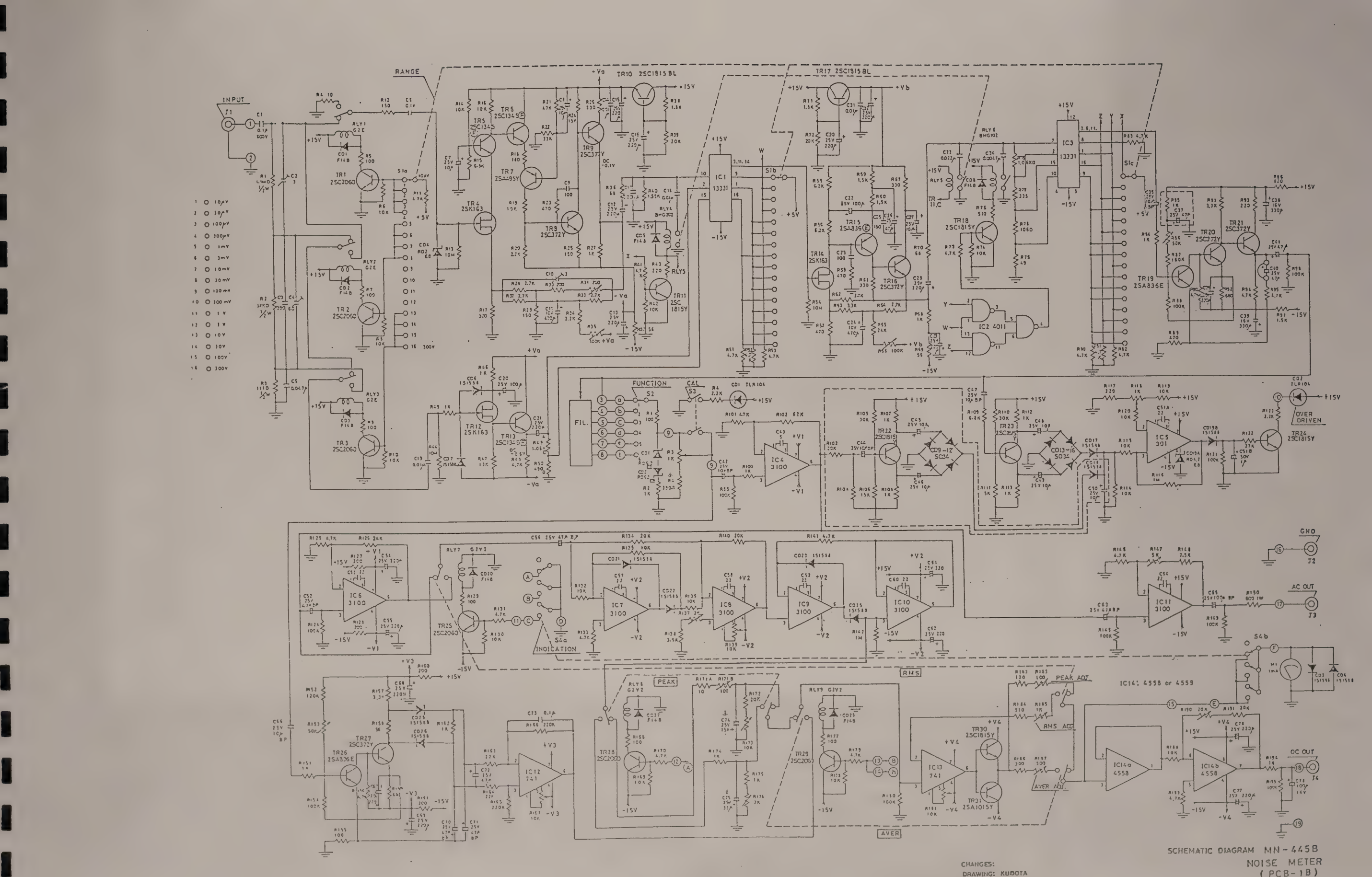
CHECK:
DATE: MAY 1981


RANGE
INPUT
J1
1 10μV
2 30μV
3 100μV
4 300μV
5 1mV
6 3mV
7 10mV
8 30mV
9 100mV
10 300mV
11 1V
12 3V
13 10V
14 30V
15 100V
16 300V
TR10 2SC1815BL
TR17 2SC1815BL
TR1 2SC2060
TR2 2SC2060
TR3 2SC2060
TR4 2SK163
TR5 2SC1345
TR7 2SA495Y
TR8 2SC372Y
TR9 2SC372Y
TR11 2SC1815Y
TR12 2SK163
TR13 2SC1345
TR14 2SK163
TR15 2SA836E
TR16 2SC372Y
TR18 2SC1815Y
TR19 2SA836E
TR20 2SC372Y
TR21 2SC372Y
TR22 2SC1815
TR23 2SC1815Y
TR24 2SC1815Y
TR25 2SC2060
TR26 2SA836E
TR27 2SC372Y
TR28 2SC2060
TR29 2SC2060
TR30 2SC1815Y
TR31 2SA1015Y
IC1 13331
IC2 4011
IC3 13331
IC4 3100
IC5 301
IC6 3100
IC7 3100
IC8 3100
IC9 3100
IC10 3100
IC11 3100
IC12 741
IC13 741
IC14a 4558
IC14b 4558
IC14: 4558 or 4559
FUNCTION
S2
CAL
S3
S1a
S1b
S1c
S4a
INDICATION
S4b
PEAK
RMS
AVER
PEAK ADJ
RMS ADJ
AVER ADJ
OVER DRIVEN
AC OUT
DC OUT
GND
J2
J3
J4
M1 1mA
FIL.
RLY1 G2E
RLY2 G2E
RLY3 G2E
RLY4 BMG02
RLY5 BMG02
RLY6 BMG102
RLY7 G2V2
RLY8 G2V2
RLY9 G2V2
+15V
-15V
+5V
-5V
+Va
-Va
+Vb
+V1
-V1
+V2
-V2
+V3
-V3
+V4
-V4
W
X
Y
Z
SCHEMATIC DIAGRAM MN-445B
NOISE METER
(PCB-1B)
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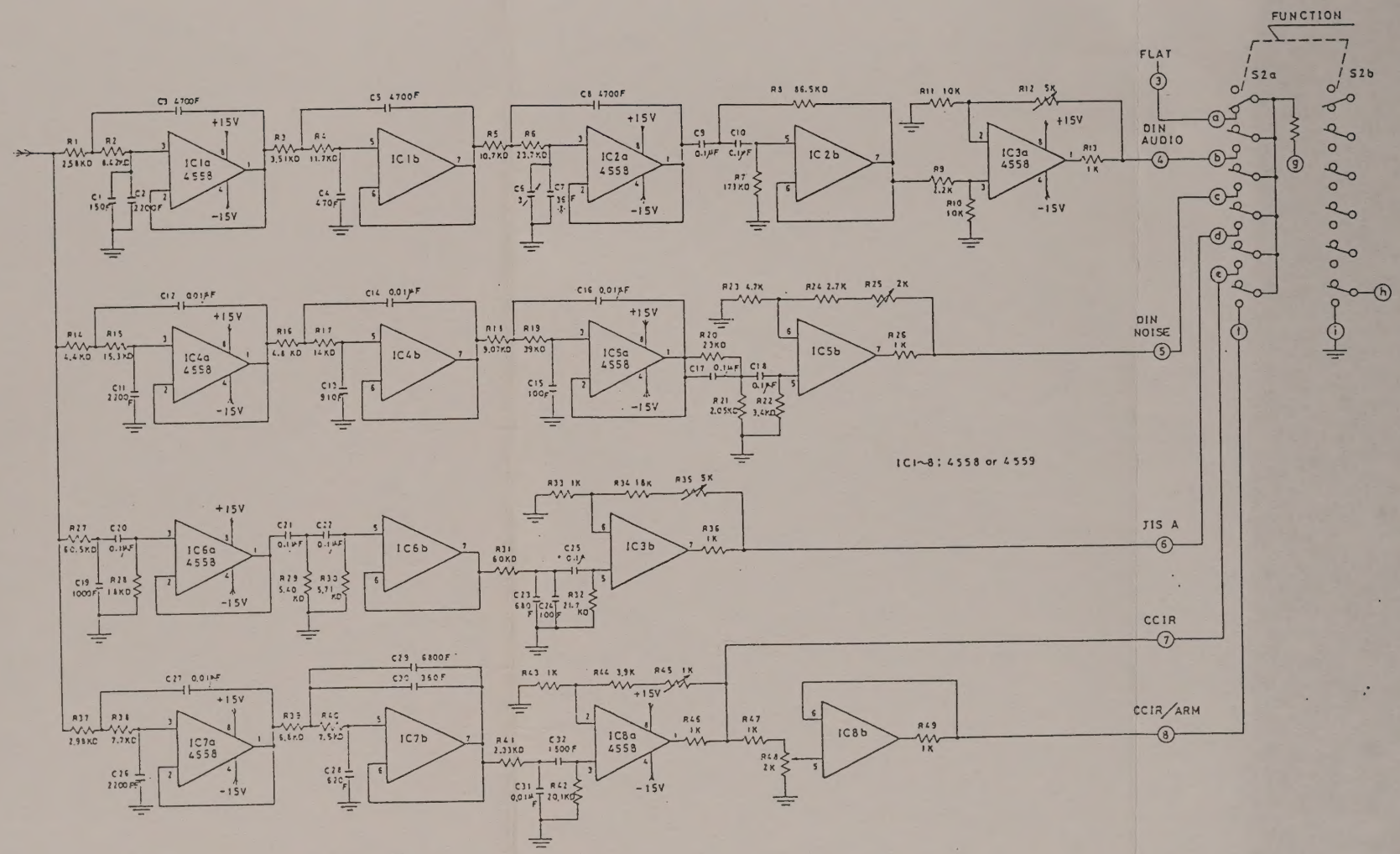

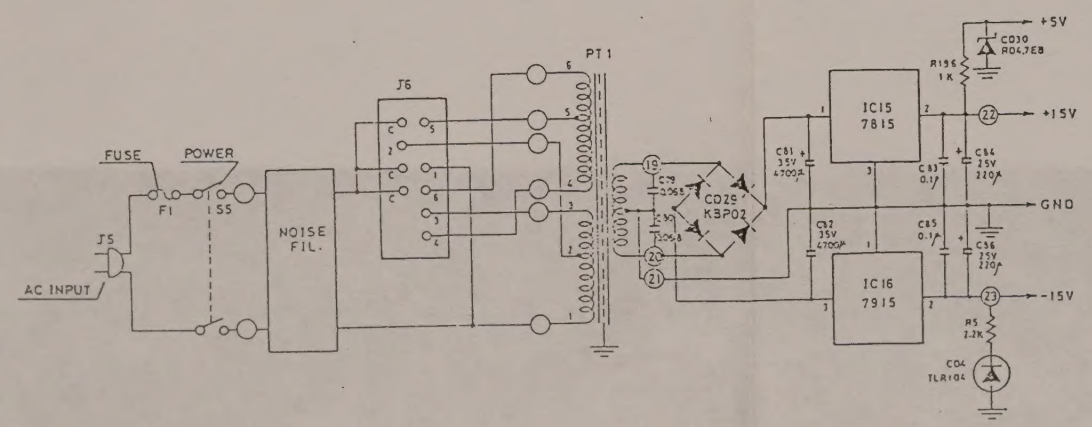

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SCHEMATIC DIAGRAM MN-445B
NOISE METER
PC8-2B

MP MASTER
MA31368